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ONTARIO WATER
RESOURCES COMMISSION

ANNUAL REPORT 1964

ORANGEVILLE

***water pollution
control plant***

DIVISION OF PLANT OPERATIONS

Ontario Water Resources Commission

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ONTARIO WATER RESOURCES COMMISSION
OFFICE OF THE GENERAL MANAGER

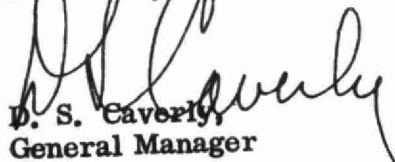
Members of the Orangeville Local Advisory Committee,
Town of Orangeville.

Gentlemen:

We are pleased to provide you with the 1964 Operating Report for the Orangeville Water Pollution Control Plant, OWRC Project No. 58-S-16.

By continuing the mutual cooperation which has existed in the past, we can look forward to greater progress in the field of water pollution control.

Yours very truly,


D. S. Caverly,
General Manager



General Manager,
Ontario Water Resources Commission.

Dear Sir:

It is with pleasure that I present to you the Annual Report of the operation of the Orangeville Water Pollution Control Plant, OWRC Project No. 58-S-16 for 1964.

This report presents design data, outlines operating problems encountered and summarizes in tables, charts and graphs all significant flow and cost data.

Yours very truly,

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

FOREWORD

This report describes the operation of this project for the year 1964. It includes a detailed description of the project, summary of operation, graphs and charts showing quality and quantity information, and project cost data.

This information will be of value to the municipality in assessing the adequacy of the works in meeting existing requirements and in projecting its capability to meet future expected demands. The cost information will be of particular interest to those concerned with developing and maintaining revenue structures.

The preparation of this report has been a cooperative effort of several groups within the Division of Plant Operations. These include the Statistical Section, Brochures Officer and the Regional Supervisor. However, the primary responsibility for the content has been with the Regional Operations Engineer. He will be pleased to discuss all aspects of this report with the municipality.

B. C. Palmer, P. Eng.,
Director,
Division of Plant Operations.

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ORANGEVILLE
water pollution control plant

operated for

THE TOWN OF ORANGEVILLE

by the

ONTARIO WATER RESOURCES COMMISSION

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DIVISION OF PLANT OPERATIONS

DIRECTOR: B. C. Palmer

Assistant Director: C. W. Perry
Regional Supervisor: A. C. Beattie
Operations Engineer: A. Clark

801 Bay Street Toronto 5

'64 REVIEW

This report gives in detail the significant data on the operation of the various treatment units at the Orangeville Water Pollution Control Plant.

The 1964 total operating cost was reduced by \$347 or 2.6% from 1963. This reduction, combined with an increase in flow, decreased the cost of sewage treated by \$13 per million gallons, a percentage reduction of 16.

The plant flow normally exceeds the capacity of the secondary section. Because of this, the effluent quality exceeds OWRC objectives of 15 ppm.

The average flow in 1964 was 0.514 mgd, an increase of almost 1% over 1963. The secondary section was overloaded hydraulically virtually all the time and the primary plant section was overloaded 18% of the time.

Flow through the secondary section, was treated to the satisfaction of the OWRC objectives. This shows a high degree of competence of the operation of the plant.

The treatment of the Town of Orangeville's waste water is expected to be satisfactory upon the completion of the new extension sometime in 1966.

GLOSSARY

BOD	biochemical oxygen demand (a measure of organic content)
cfm	cubic feet per minute
comminution	shredding of solids into small fragments
DWF	dry weather flow
effluent	outflow
flocculation	bringing very small particles together to form a larger mass (the floc) before settling
fps	feet per second
gpcd	gallons per capita per day
gpm	gallons per minute
grit	sand, dust, stones, cinders and other heavy inorganic material
influent	inflow
lin. ft.	lineal feet
mgd	million gallons per day
mlss	mixed liquor suspended solids
ppm	parts per million
ss	suspended solids
TDH	total dynamic head (usually refers to pressure on a pump when it is in operation)

HISTORY

1956 - 1964

INCEPTION

In October 1956, the Town of Orangeville initiated plans with the Ontario Water Resources Commission for an expansion of their existing water pollution control plant. The firm of Proctor and Redfern of Toronto was engaged to prepare plans and specifications for the project.

APPROVAL

In October 1956, the municipality signed an agreement with the Ontario Water Resources Commission to construct and operate the expanded plant.

CONSTRUCTION

The contract was awarded to the low bidder, Frid Construction Limited and work commenced in August 1959 and was completed December 1960.

TOTAL COST

\$176,332.00

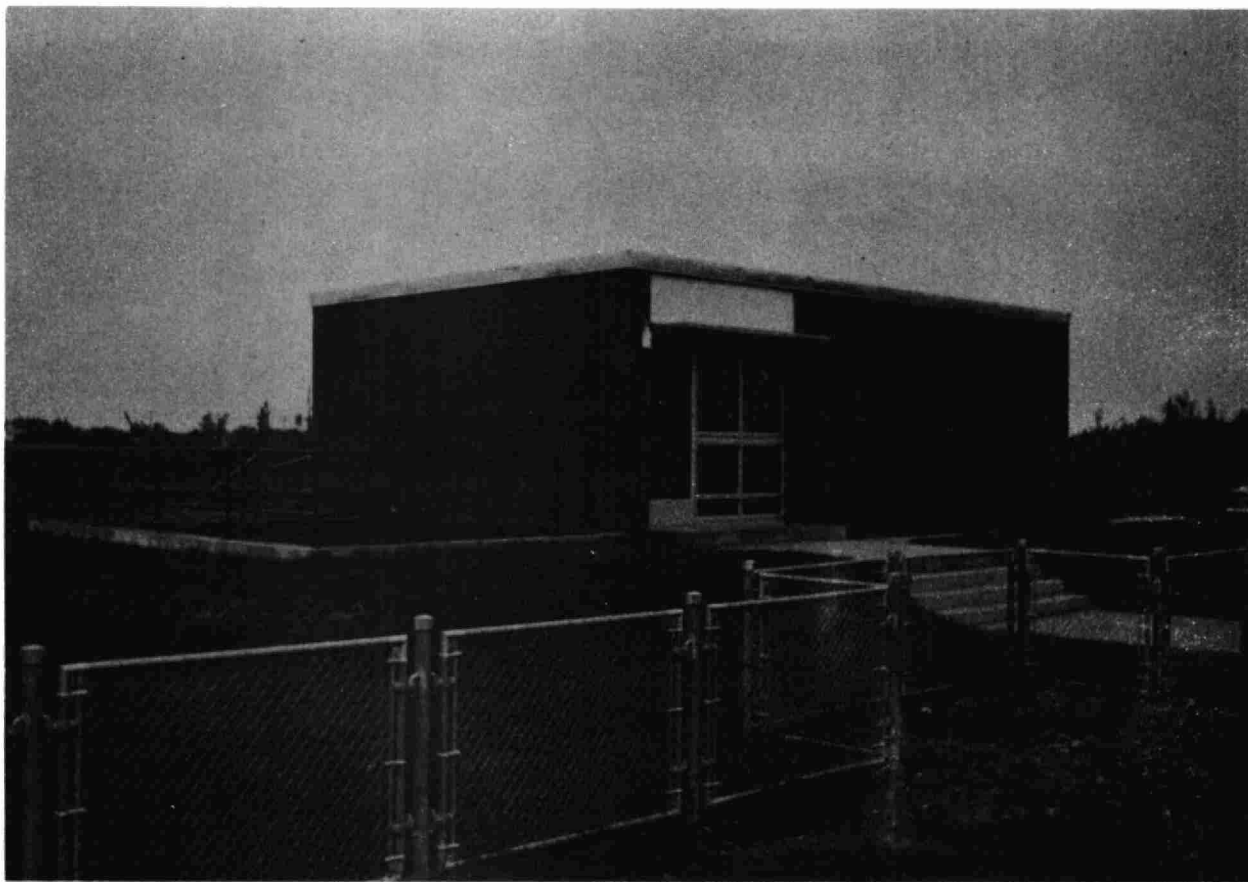


CLARENCE CLARKE

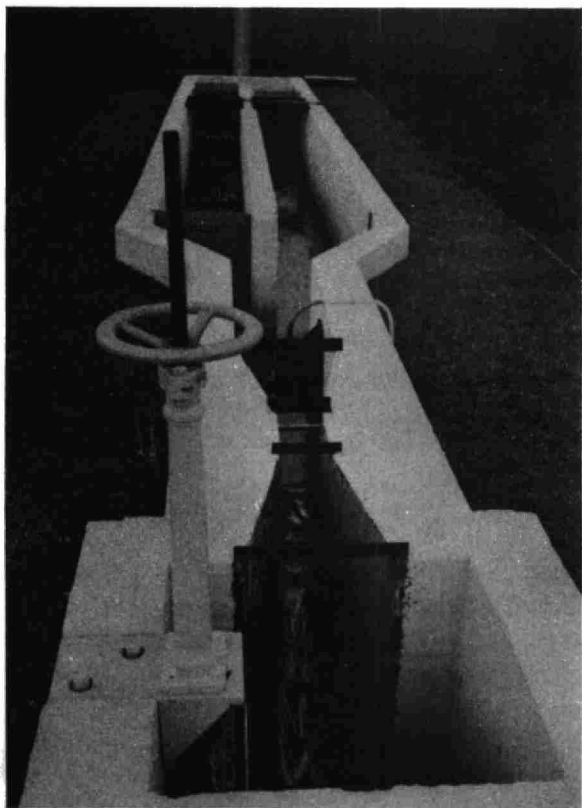
Project Staff

Mr. Clarence Clarke, the Chief Operator at the Orangeville Water Pollution Control Plant joined the Commission in May 1960. He has proved to be an able and conscientious worker and is to be commended for the efficient and economical operation of the plant.

Mr. Clarke has successfully completed the Sewage Operators' Courses offered by the Ontario Water Resources Commission and holds the senior certificate.



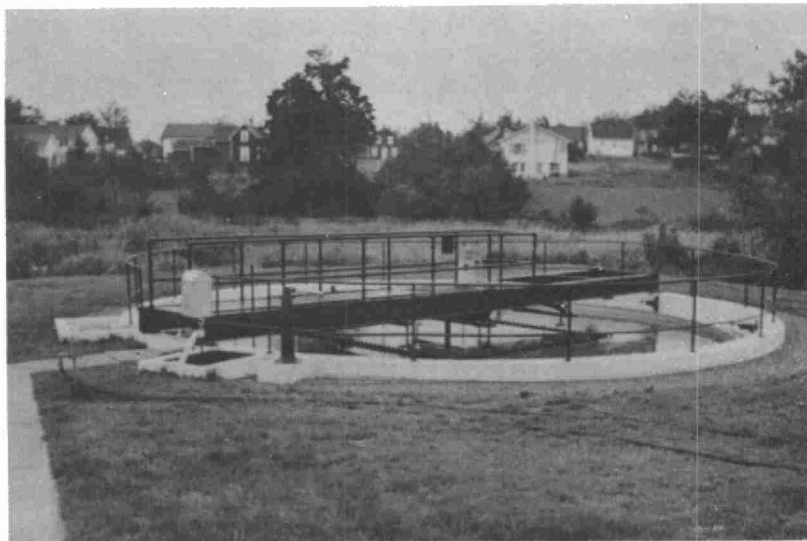
ORANGEVILLE WPCP



INFLUENT WORKS

**DESCRIPTION
OF
PROJECT**

PRIMARY SEDIMENTATION TANK
ALLOWS HEAVIER SOLIDS TO
SETTLE; SURFACE SCUM AND
GREASE ARE ALSO REMOVED.



INFLUENT WORKS

The sewage enters the plant by means of a 30" diameter sewer and is coarse screened to remove large objects which may damage equipment. It is then pumped by two raw sewage lift pumps to a grit channel which reduces the flow velocity sufficiently to allow the grit to settle out.

The raw sewage then flows to the primary sedimentation tank.

PRIMARY SEDIMENTATION TANK

The primary sedimentation tank is designed to provide an adequate detention period to allow the heavier solids to settle out, and for the removal of surface scum and grease. The heavier solids which settle out to the bottom of the tank and surface scum are collected and pumped to a holding tank.

The primary sedimentation tank is designed to provide sufficient detention to allow for the removal of 30-35% of the heavy organic material.

The settled waste water flows over the weir, and is split, 170,000 gallons per day flowing to the aeration tank. The remaining bypasses the plant and is chlorinated and flows to the river.

AERATION TANK

Settled sewage flows from the primary

sedimentation tanks to the aeration. There it is mixed with activated sludge which is returned from the final sedimentation tanks and aerated.

The aeration sections retain the sewage for 6 1/2 hours at a flow of .170 million gallons per day. Air is supplied by two blowers with a total capacity of 460 cubic feet of air per minute.

FINAL SEDIMENTATION TANK

The aerated mixed liquor from the aeration section is retained in the final sedimentation tank for approximately 2.5 hours at a flow of 170,000 gallons. This allows the activated sludge to settle. It is collected from the bottoms of the tanks and returned to the aeration sections. (Excess activated sludge is returned to the primary sedimentation tanks and is pumped from there to the digester.) The remaining liquid flows over the weirs of the final sedimentation tanks to the chlorine contact chambers.

DIGESTION

There is no controlled digestion at this plant. The sludge from the primary and final sedimentation tanks is pumped to a holding tank where it is held prior to disposal by tank truck.

PROJECT COSTS

LONG TERM DEBT

(Total Capital Cost): \$176,332.00

The total cost to the municipality during 1964 was as follows:

Net Operating	\$13,000.89
Debt Retirement	3,558.00
Reserve	1,245.00
Interest Charged	9,779.84
TOTAL	\$27,583.73

RESERVE ACCOUNT

Balance at January 1, 1964	\$ 3,620.13
Deposited by Municipality	1,245.00
Interest Earned	226.26

\$ 5,901.39

Less Expenditures

-

Balance at December 31, 1964 \$ 5,091.39

DEBT OUTSTANDING: \$158,063.99

MONTHLY COSTS

MONTH	TOTAL EXPENDITURE	PAYROLL	CASUAL PAYROLL	FUEL	POWER	CHEMICAL	GENERAL SUPPLIES	EQUIPMENT	REPAIRS & MAINTENANCE	* SUNDRY
JAN	520.54	330.20		25.90	94.23		26.66	18.03	14.76	10.76
FEB	1043.82	330.20		24.42	123.93	278.10	14.68	14.85	20.23	237.41
MARCH	936.04	330.20		23.83	123.33		11.64			447.04
APRIL	855.29	377.94		26.20	116.32	278.10	43.17			13.56
MAY	1294.90	513.66		24.42	105.02	139.05	9.73		137.46	365.56
JUNE	1531.04	424.71			126.30	169.94	17.99		8.49	783.61
JULY	2172.34	342.44			92.75	535.60	3.80			1197.75
AUG	676.86	342.44			114.13		17.51	29.29	78.28	95.21
SEPT	35.03	342.44			104.53	(490.00)	10.38		6.37	61.31
OCT	1728.96	342.44			118.19	698.10	16.93	83.27		470.03
NOV	494.01	342.44		23.10	98.71	(280.95)	15.87		81.38	213.46
DEC	1712.06	513.66		47.74	223.64	377.44	28.24		109.84	411.50
TOTAL	13000.89	4532.77		195.61	1441.08	1705.38	216.60	145.44	456.81	4307.20

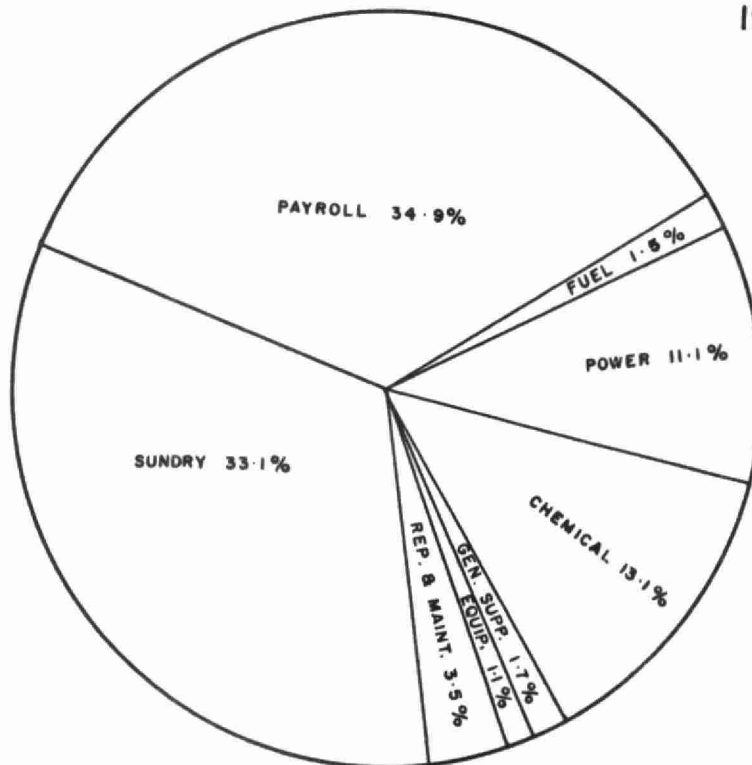
* SUNDRY INCLUDES SLUDGE HAULING COSTS WHICH WERE \$3277.06
BRACKETS INDICATE CREDIT

YEARLY COSTS

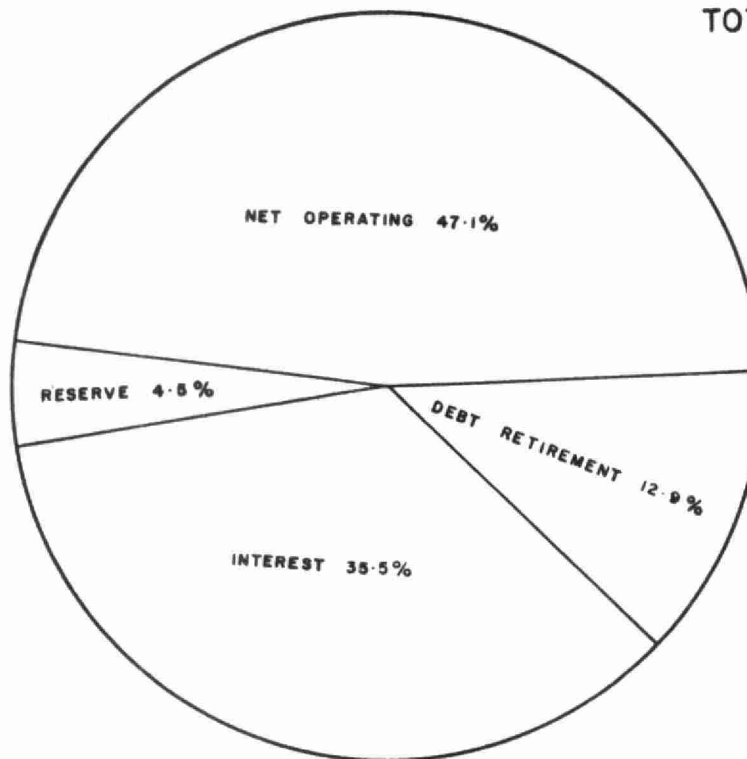
YEAR	M.G. TREATED	TOTAL COST	COST PER FAMILY PER YEAR	COST PER MILLION GALLONS	COST PER L.B. OF BOD REMOVED
1961	168,643	\$12992.61	* \$10.92	\$77.00	-
1962	161,630	10616.07	8.81	65.80	4 CENTS
1963	161,545	13347.87	10.53	82.60	7 CENTS
1964	187,373	13000.89	9.94	69.38	8 CENTS

* BASED ON ANNUAL POPULATION ESTIMATE AND 3.9 PERSONS PER FAMILY

1964 OPERATING COSTS

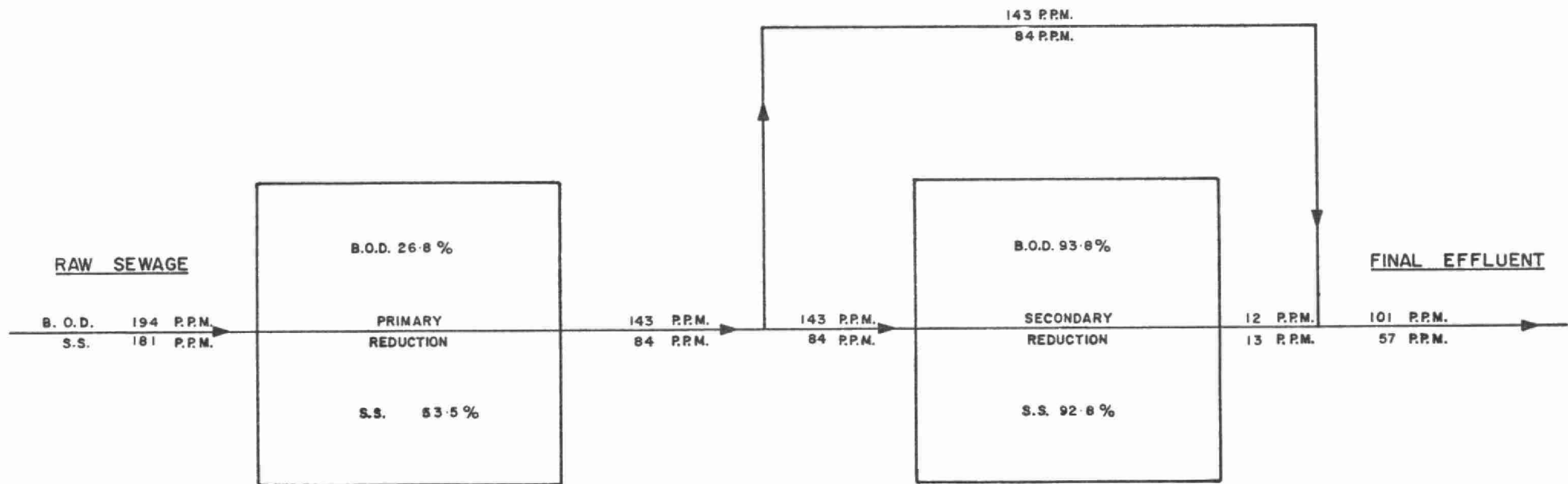


TOTAL ANNUAL COST



***Technical
Section***

ORANGEVILLE W.P.C.P.
SCHEMATIC SKETCH SHOWING EFFICIENCIES
OBTAINED BY PRIMARY & SECONDARY UNITS



NOTE: OVERALL PLANT EFFICIENCY

B.O.D. = 87.1 %
S.S. = 68.5 %

ABOVE LOADINGS BASED ON AVERAGE OF SAMPLE RESULTS FOR 1964

B.O.D. — RAW SEWAGE 194 P.P.M.
S.S. — RAW SEWAGE 181 P.P.M.

Design—Data

GENERAL

Type of Plant - Primary treatment, part of effluent is given secondary treatment by the old plant.

Design Population - 7,500 persons

Per Capita Flow - 100 gallons per day.

Design Plant Flow - 750,000 gallons per day.

Five Day BOD -

Raw Sewage - 200 ppm
Removal - 36%

Suspended Solids -

Raw Sewage - 250 ppm
Removal - 60%

INFLUENT WORKS

Inlet to raw sewage pump well.
30 inch diameter sewer pipe.

SCREENING

Coarse Screen (at pump well) - 1960
1.25 in. x 0.25 at 2 inch centres.

Raw Sewage Pump well - 1960
15ft. x 10 ft. x 8 ft. (overflow)
1200 cu. ft. or 7480 gallons.

Retention - 14.4 minutes at design flow
- 750,000 GPD.

LIFT PUMPS

Raw Sewage lift pumps - 1960
2 - Smart-Turner vertical centrifugal pumps each rated at 300 GPM at a head of 20 feet.

Each is driven by a 3 HP General Electric Motor. 1 Smart-Turner vertical centrifugal pump rated at 500 GPM at a head of 25 feet and driven by a 7.5 HP General Electric Motor.

GRIT REMOVAL

Grit Channels - 1960

Screens - 1.25 in. x 0.25 in. at 2 inch centres.

Channels - 2 each 25 ft. x 1.896 feet (top of wall)

Water Depth - 0.366 ft. at 1 fps.

PRIMARY SEDIMENTATION TANKS

Primary Clarifier - 1960

Size - 35 feet diameter by 12 feet deep (S. W. D.)

Capacity - 1520 cu. ft. or 72,000 gallons.

Retention - 2.31 hours at 750,000 GPD.

Surface Settling rate - 780 gals/sq. ft. of surface area/day.

Weir overflow rate - 7,350 gal/lin. ft. of weir/day.

Raw Sludge pump - 1960

1 - Carter plunger type rated at 75 GPM at a head of 15 feet and driven by a 2 HP General Electric Motor.

Division Chamber - 1960

Divides flow to aeration tanks or chlorine contact chamber.

AERATION SECTION

Aeration tanks - 1929

Size - 2 tanks each 84 ft. x 8 ft. x 8 ft. deep.

Capacity - 5380 cu. ft. each or 67,000 gallons total.

Retention - 6.44 hours at 250,000 GPD.

Air blowers - 1929

2 - Babcock-Wilcox and Goldie-McCulloch air blowers each rated at 230 c.f.m. at 10 psig and each driven by a Lancashire Dynamo and Cripto 20 HP electric motor.

Return Sludge pump

1 - Smart-Turner pump rated at 75 GPM at a head of 25 feet and driven by a 1.5 HP General Electric Motor.

FINAL SEDIMENTATION TANK

Final settling tanks

Size - 2 tanks each 14 ft. x 14 ft. x 7.5 ft. deep (average liquid depth).

Capacity - 1520 cu. ft. each or 18,950 gallons.

Surface settling rate - 638 gal/sq. ft. of surface area/day at 250,000 gpd.

Retention - 1.82 hours at 250,000 gal. per day.

Weir overflow rate - 1,300 gal/lin. ft. of weir/day at 250,000 gpd.

CHLORINE CONTACT CHAMBER

Chlorine Contact Chamber - 1960

Size - 29.75 ft. x 12 ft. x 6.92 ft. deep (max. liquid depth)

Capacity - 2470 cu. ft. or 15,400 gal.

Retention - 29.6 minutes at 750,000 gpd.

CHLORINATOR

Chlorinator - 1960

1 - Wallace and Tiernan bell-jar type chlorinator with a maximum rated capacity of 75 pounds of chlorine per day.

MISCELLANEOUS PUMPS

Sump pump in control building.

1 - Jacuzzi Universal submersible sump pump driven by 1/3 HP Jacuzzi Universal electric motor.

Primary Effluent Well Pump

1 - Wemco torque flow pump rated at 150 gpm at a head of 25 feet and driven by a 3 HP General Electric Motor.

Sump pump in old control building.

1 - Kenco Multi-Purpose pump rated at 1000 gpd at a head of 15 feet and driven by a 1/3 HP Kenco electric motor.

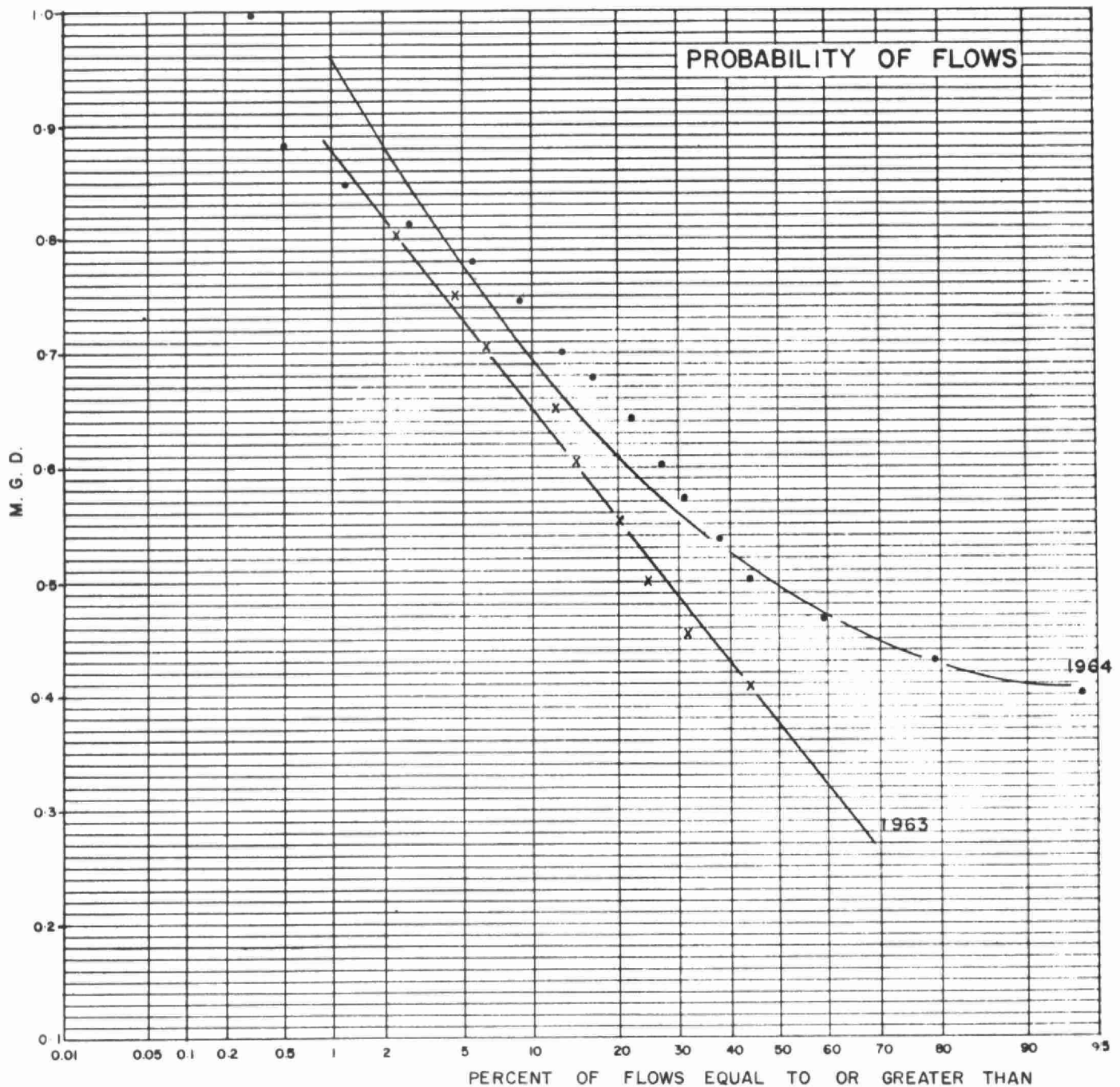
1 - Burgess-Manning Pen Flowmeter with totalizing, indicating and recording attachments.

SLUDGE HOLDING TANK

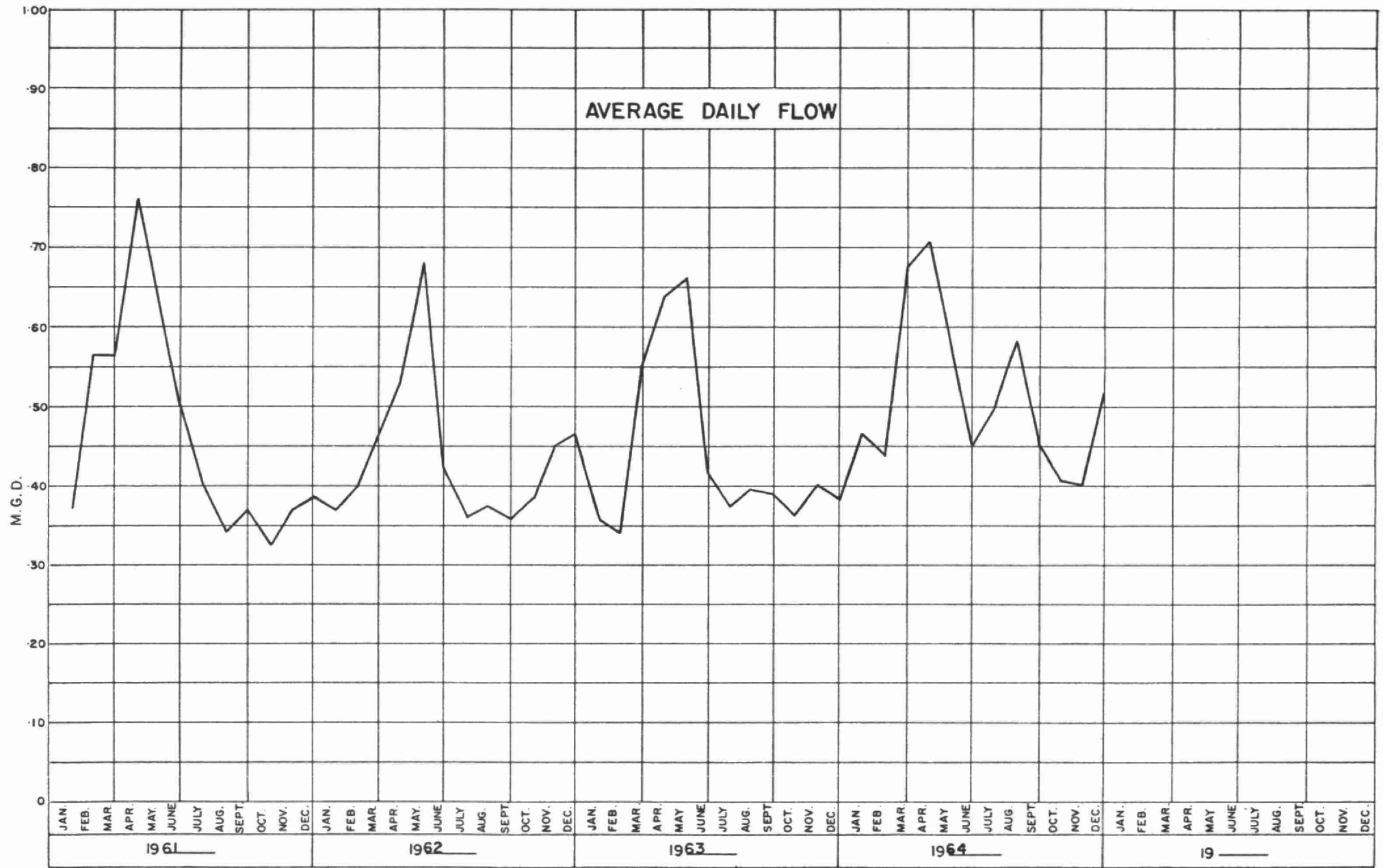
Size - 18.5 ft. diameter x 15 ft. deep

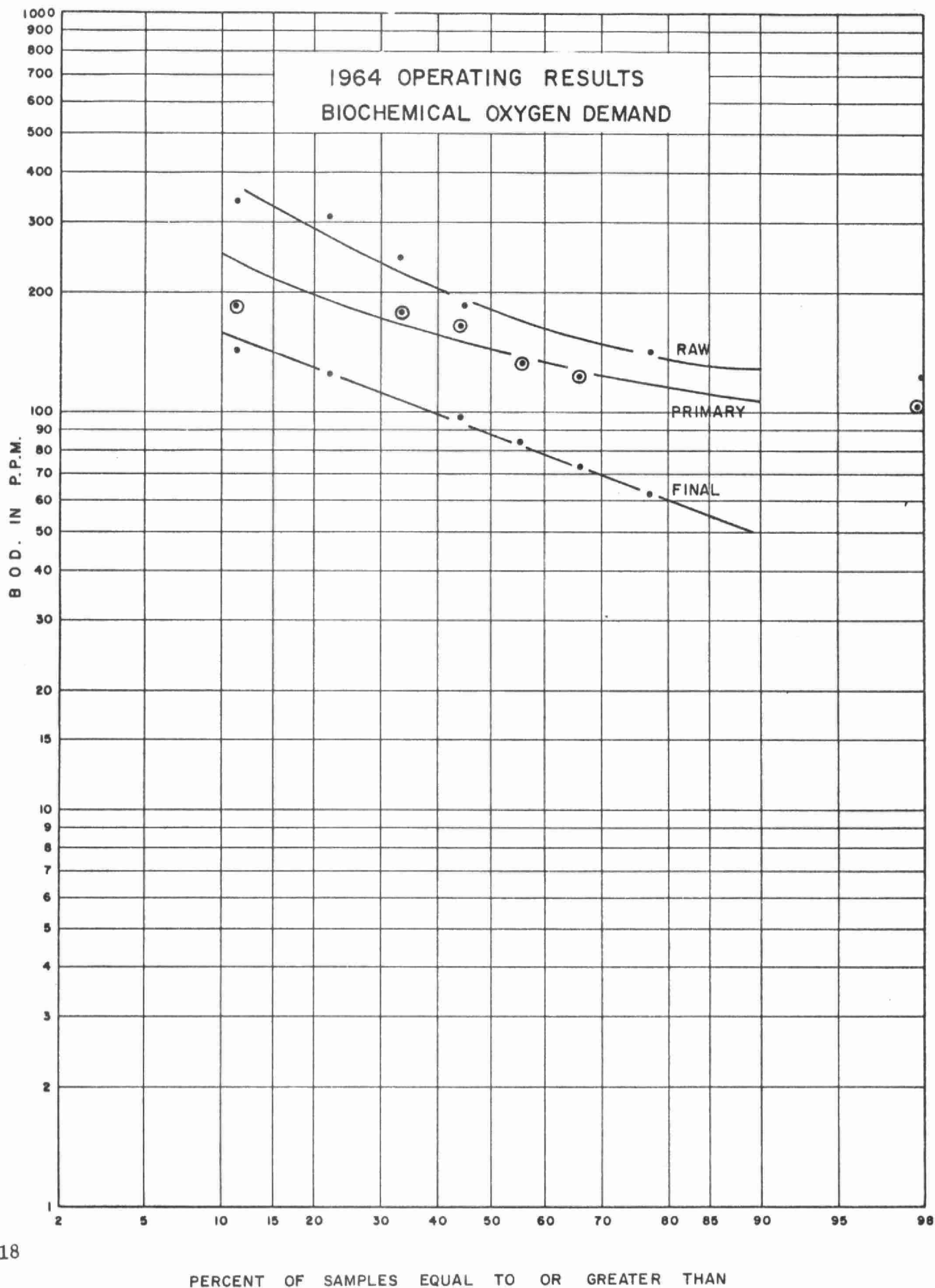
Capacity - 4030 cu. ft. or 25,125 gallons.

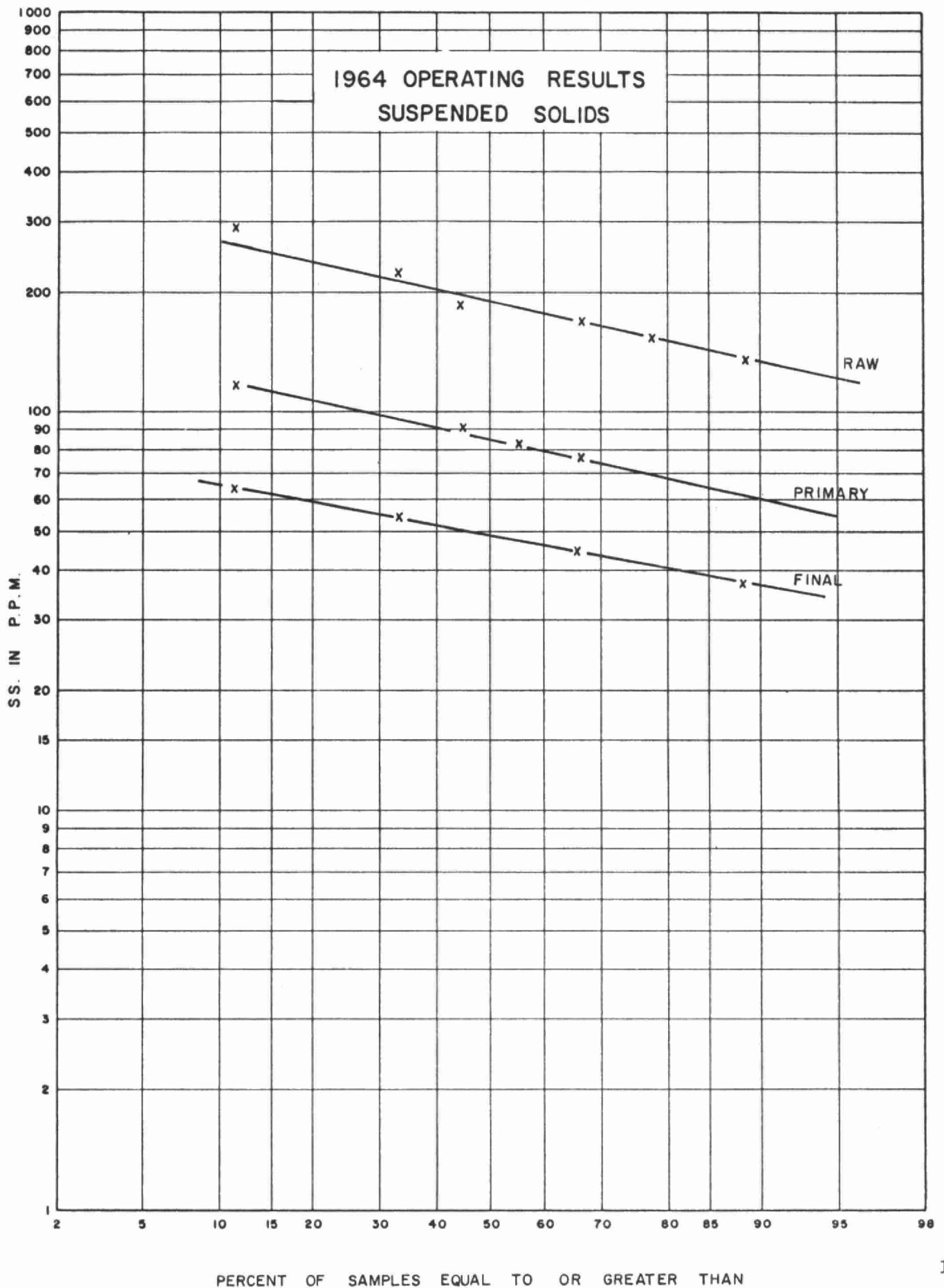
Process Data

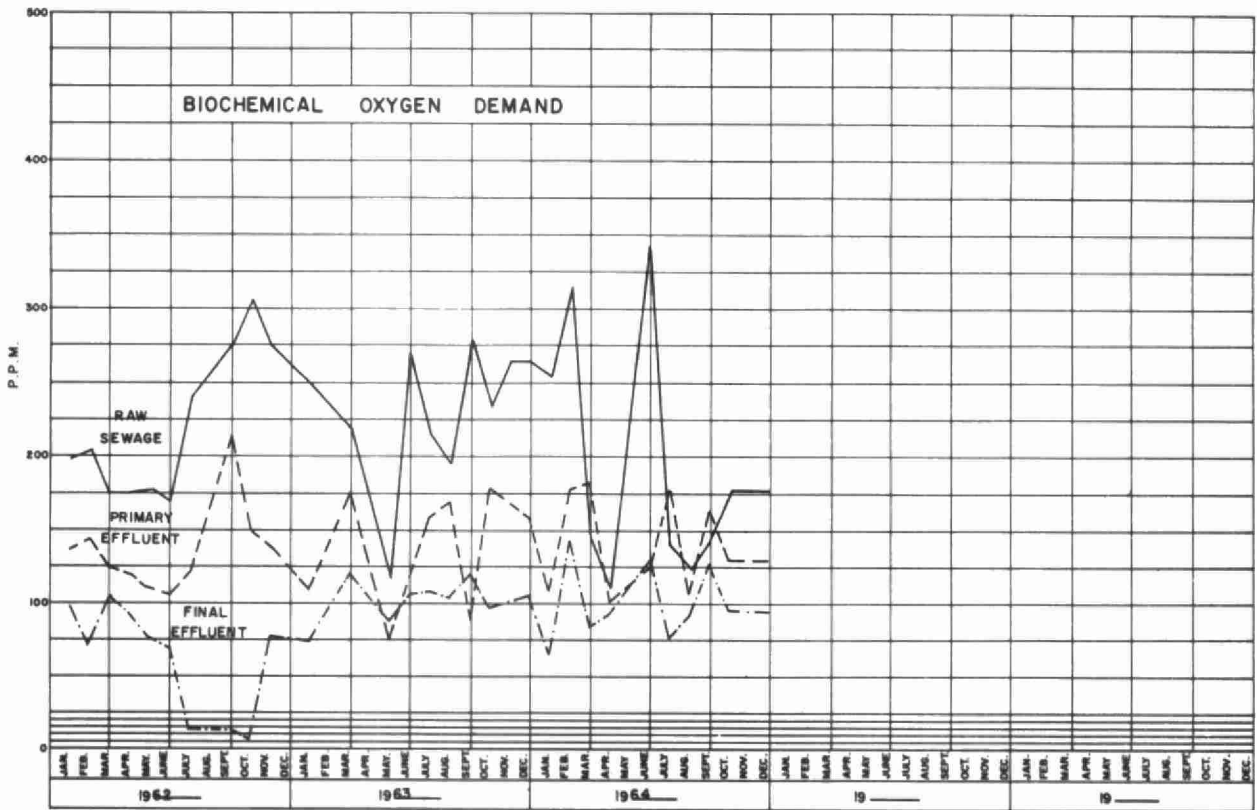


The average flow for 1964 was 0.514 mgd 18% more than 1963. The fact that a large percentage of this received only primary treatment is reflected in the fact that the average BOD of the effluent is 85 ppm, considerably in excess of the OWRC requirement of 15 ppm. It is expected that the plant expansion in 1966 will solve the problem of the poor effluent.

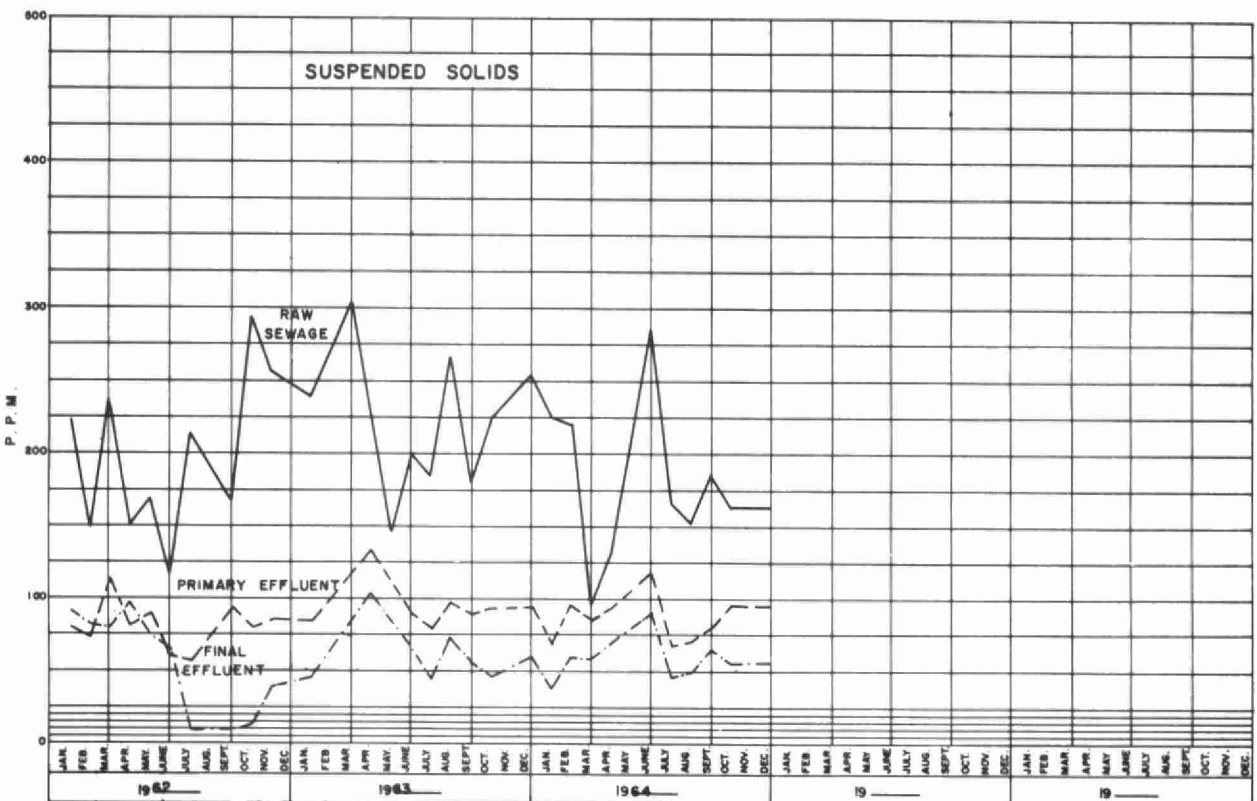








MONTHLY VARIATIONS



GRIT, B.O.D AND S.S. REMOVAL

MONTH	B. O. D.				S. S.				GRIT REMOVAL CU. FT.
	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	INFLUENT PPM.	EFFLUENT PPM.	% REDUCTION	TONS REMOVED	
JAN.	255	65	74.5	13.6	226	36	84	13.6	12
FEB.	315	145	54	10.8	222	57	74.5	10.5	40
MAR.	145	85	41.5	6.3	94	56	40.5	4	58
APR.	110	94	14.5	1.7	130	68	47.6	6.6	126
MAY	194 *	101	48.0	8.2	181	57	68.5	10.9	34
JUNE	340	130	61.5	13.3	288	88	69.5	12.5	44
JULY	140	78	44.0	4.8	166	44	73.5	9.4	258
AUG.	125	92	26.5	3.0	154	46	70.0	9.8	232
SEPT.	145	128	11.5	1.1	186	62	66.5	8.4	132
OCT.	175	96	45.0	5.0	164	54	67.0	7.0	32
NOV.	194 *	101	48.0	5.6	181	57	68.5	7.5	20
DEC.	194*	101	48.0	7.5	181	57	68.5	10.0	32
TOTAL	-	-	-	87.1	-	-	-	116.2	1020
AVG.	194	101	48.0	7.3	181	57	68.5	9.7	85

*average values substituted. No sample.

COMMENTS

The percent reduction of suspended solids (68.5%) is greater than the reduction of BOD (48.0%). This points out the fact that the secondary treatment is inadequate. A plant designed to handle the loads and flows received by this plant would be expected to give reduction of both BOD and suspended solids in excess of 90%.

The excessive load of grit is caused by old combined sewers which deliver both sanitary and storm waste water.

AERATION SECTION

MONTH	PRIM. EFFL. B.O.D. PPM.	ML.SS. PPM.	LBS. BOD. PER 100 LBS. M. L. S. S.	CUBIC FEET AIR PER LB. BOD. REMOVED
JANUARY	108	1234	18	1856
FEBRUARY	180	1027	37	1132
MARCH	185	847	46	1046
APRIL	102	867	25	2169
MAY	-	1383	-	-
JUNE	126	1327	20	1593
JULY	180	1372	28	1011
AUGUST	108	1344	17	1731
SEPTEMBER	165	1634	21	1161
OCTOBER	132	1748	16	1513
NOVEMBER	-	1716	-	-
DECEMBER	-	1766	-	-
TOTAL	-	-	-	-
AVERAGE	143	1355	25	1468

COMMENTS

The figure of 25 pounds of BOD per 100 pounds of mixed liquor suspended solids generally indicates good loading in the aeration section. In this case the figure of 1468 cubic feet of air per pound of BOD removed indicates a poor efficiency of aeration.

DIGESTER OPERATION

MONTH	SLUDGE TO DIGESTERS			SLUDGE FROM DIGESTERS			GAS PRODUCED 1000'S Cu. Ft.
	1000'S CU. FT.	% SOLIDS	% VOL. MAT.	1000'S CU. FT.	% SOLIDS	% VOL. MAT.	
JAN.	6.92	-	-	3.68	-	-	-
FEB.	6.27	-	-	2.56	-	-	-
MAR.	6.71	-	-	2.56	-	-	-
APR.	7.04	-	-	4.05	-	-	-
MAY	7.88	-	-	4.42	-	-	-
JUNE	6.83	-	-	4.42	-	-	-
JULY	7.31	-	-	6.63	-	-	-
AUG.	8.94	-	-	-	-	-	-
SEPT.	8.65	-	-	5.53	-	-	-
OCT.	8.94	-	-	4.79	-	-	-
NOV.	8.65	-	-	3.68	-	-	-
DEC.	8.80	-	-	3.69	-	-	-
TOTAL	92.94	-	-	46.01	-	-	-
AVG.	7.74	-	-	3.83	-	-	-

COMMENTS

The digesters at the Orangeville plant is unheated and there is little digestion in the winter months.

It may be seen from the above that the average volume reduction in the sludge pumped to the digesters is 50%. This is excellent performance for an unheated digester.

CHLORINATION

MONTH	PLANT FLOW (MG)	POUNDS CHLORINE	DOSAGE RATE (PPM)
JANUARY	14.330	1002	6.99
FEBRUARY	12.746	973	7.63
MARCH	20.885	1024	4.90
APRIL	21.290	996	4.68
MAY	17.587	1069	6.08
JUNE	12.681	1029	8.11
JULY	15.330	1109	7.23
AUGUST	18.053	1087	6.02
SEPTEMBER	13.507	1030	7.62
OCTOBER	12.682	1098	8.66
NOVEMBER	12.081	1028	8.51
DECEMBER	16.201	1060	6.54
TOTAL	187.373	12505	-
AVERAGE	15.614	1042	6.67

COMMENTS

The chlorine dosage of 6.67 ppm is slightly high due to the high chlorine demand of the relatively poor effluent.

LABORATORY LIBRARY



96936000119335

RECOMMENDATIONS

It is strongly recommended that the Town of Orangeville proceed with the construction of a secondary treatment plant to ensure that the OWRC objectives for treatment plant effluents are met.



